# Sample Paper 6

## Class XII 2023-24

## Chemistry

**Time: 3 Hours** **Max. Marks: 70**

**General Instructions:**

1. There are 33 questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

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# SECTION-A

**Directions (Q. Nos. 1-16) :** The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

**1.** Enzyme is:

(a) Carbohydrate (b) Lipid

(c) Proteins (d) None of these

**2.** A compound on hydrolysis gives 1°-amine. The compound is

(a) anilide (b) amide

(c) cyanide (d) none of these

**3.** The oxidation state of nickel in $[Ni(CO)_4]$ is :

(a) 4 (b) 0

(c) 2 (d) 3

**4.** Formula of copper pyrite is :

(a) $Cu_2S$ (b) CuFeS

(c) $CuFeS_2$ (d) $Cu_2Fe_2S_2$

**5.** Which one of the following will produce maximum depression of freezing point?

(a) $K_2SO_4$ (b) NaCl

(c) Urea (d) Glucose

**6.** Which of the following statement for order of reaction is not correct?

(a) Order can be determined experimentally

(b) Order of reaction is equal to sum of the powers of concentration terms in differential rate law

(c) It is not affected with the stoichiometric coefficient of the reactants

(d) Order cannot be fractional

**7.** Carbon atom in the carbonyl group is:

(a) *sp*-hybridised (b) $sp^2$-hybridised

(c) $sp^3$-hybridised (d) $dsp^2$-hybridised

**8.** Fused NaCl on electrolysis gives ..... on cathode.

(a) chlorine (b) sodium

(c) sodium amalgam (d) hydrogen

**9.** Which of the following aqueous solution should have the highest boiling point?

(a) 1.0 M NaOH (b) 1.0 M $Na_2SO_4$

(c) 1.0 M $NH_4NO_3$ (d) 1.0 M $KNO_3$

**10.** What are the products formed by the chlorination of methane in diffused sunlight?

(a) $CCl_4$ (b) $CH_2Cl_2$

(c) $CHCl_3$ (d) All of these

**11.** Which one of the following is diamagnetic ion?

(a) $Co^{2+}$ (b) $Ni^{2+}$

(c) $Cu^{2+}$ (d) $Zn^{2+}$

**12.** The rate of the reaction $2N_2O_5 \longrightarrow 4NO_2 + O_2$ can be written in three ways:

$$-\frac{d[N_2O_5]}{dt} = k[N_2O_5]$$

$$\frac{d[NO_2]}{dt} = k'[N_2O_5]$$

$$\frac{d[O_2]}{dt} = k''[N_2O_5]$$

The relationship between $k$ and $k'$ and between $k$ and $k''$ are

(a) $k' = 2k; k' = k$ (b) $k' = 2k; k'' = \frac{k}{2}$

(c) $k' = 2k; k'' = 2k$ (d) $k' = k; k'' = k$

**Directions (Q. Nos. 13-16) :** Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

**13.** **Assertion :** Hydrolysis of sucrose is known as inversion of cane sugar.
**Reason :** Sucrose is a disaccharide.

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Both the Assertion and Reason are incorrect.

**14.** **Assertion :** Glycosides are hydrolyzed in acidic conditions.
**Reason :** Glycosides are acetals.

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Both the Assertion and Reason are incorrect.

**15.** **Assertion :** According to transition state theory for the formation of an activated complex. one of the vibrational degree of freedom.
**Reason :** Energy of the activated complex is higher than the energy of reactant molecules.

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Both the Assertion and Reason are incorrect.

**16.** **Assertion :** 4-Nitrochlorobenzene undergoes nucleophilic substitution more readily than chlorobenzene.
**Reason :** Chlorobenzene undergoes nucleophilic substitution by elimination-addition mechanism while 4-nitrochlorobenzene undergoes nucleophilic substitution by addition-elimination mechanism.

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Both the Assertion and Reason are incorrect.

# SECTION-B

**Directions (Q. Nos. 17-21) :** This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

**17.** What is meant by molality of the solution ?

**18.** Any transition series contains only ten elements. Why ?

**19.** What do you mean by half time of a reaction?

**20.** What are alcohols?

**or**

What do you mean by primary alcohols?

**21.** Give one example of each of the following reactions:
(i) Wurtz reaction
(ii) Wurtz-Fitting reaction.

# SECTION-C

**Directions (Q. Nos. 22-28) :** This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

**22.** (i) What happens when iodoform is heated with silver powder? Write the chemical equation.
(ii) Out of ethyl bromide and ethyl chloride which has higher boiling point and why?

**23.** How is standard Gibbs energy of a reaction is related to its equilibrium constant ?

**24.** Construct electric cells for the following reactions:
(i) $Fe + Cu^{2+} \longrightarrow Cu + Fe^{2+}$
(ii) $2Fe^{3+} + 2Cl^{-} \longrightarrow 2Fe^{2+} + Cl_2$

**25.** Write the electronic configuration of $Cu^{+}$ and also draw the figure.

**26.** Write a note on rules for writing IUPAC names of alcohols.

**27.** How can one reduce carboxylic acid to alcohol?

**or**

Arrange the following compounds in the increasing order of their boiling points :
$CH_3CH_2CH_2CHO$, $CH_3CH_2CH_2CH_2OH$, $H_5C_2 - O - C_2H_5$, $CH_3CH_2$ $CH_2CH_2CH_3$

**28.** Write main series of transition metals.

# SECTION-D

**Directions (Q. Nos. 29-30) :** The following questions are case-based questions. Each question has an internal choice and carries 4 marks each. Read the passage carefully and answer the questions that follow.

**29.** Oxidation of Aldehydes and Ketones (Popoff's Rule)Aldehydes differ from ketones in their oxidation reactions.

Aldehydes are easily oxidised to carboxylic acids on treatment with common oxidising agents like $HNO_3$, $KMnO_4$, $K_2Cr_2O_7$, etc. Even mild oxidising agents mainly Tollen's reagent, Fehling's solution, Benedict reagents, also oxidise aldehydes.

Ketones are difficult to oxidise. They are oxidised by strong oxidising agents at elevated temperature. Their oxidation involves C—C cleavage to form mixture of carboxylic acids. The oxidation of ketones is governed by Popoff's rule. 'In unsymmetrical ketones, on oxidation of ketones to carboxylic acids, $\diagup C{=}O$ group is retained by smaller alkyl group' is Popoff's rule.

$$R-\overset{1}{C}H_2-\underset{\underset{O}{\|}}{\overset{2}{C}}-\overset{3}{C}H_2-R' \xrightarrow[\Delta]{[O]\ K_2Cr_2O_7/H_2SO_4\ \text{conc.}}$$

$$\underset{\text{[By cleavage of } C_1-C_2 \text{ bond]}}{R-COOH} + RCH_2COOH + \underset{\text{[By cleavage of } C_2-C_3 \text{ bond]}}{RCH_2COOH} + R'-COOH$$

Ketones do not react with Tollen's reagent and Fehling's solutions. Methyl ketones give yellow precipitate of iodoform with $I_2$ and NaOH. Ketones can be oxidised by haloform reaction if they have one methyl group.

Answer the following questions:

(a) Why is it difficult to oxidise ketone as compared to aldehyde?

(b) What happens when 3-methyl-pentan-2-one reacts with sodium hypochlorite? Write chemical reaction involved?

(c) A compound A $C_5H_{10}O$ does not give silver mirror with Tollen's reagent, it gives iodoform test with $I_2$/NaOH. Write possible structures of compounds and write the chemical reactions involved.

**or**

(d) What happens when :

(i) Pentan-2-one is oxidised with $K_2Cr_2O_7/H_2SO_4$(conc.) on heating.

(ii) Acetophenone is oxidised on heating with $K_2Cr_2O_7/H_2SO_4$(conc).

**30.** Most distinctive properties of transition metal complexes is their wide range of colours. The colour of complex is complementary to that which is absorbed. The complementary colour is the colour generated from the wavelength left over. The following table gives the relationship of the different wavelength absorbed and the colour observed.

**Table : Relationship between the Wavelength of Light absorbed and the Colour observed in some Coordination Entities Coordination entity**

| Coordination entity | Wavelength of light absorbed (nm) | Colour of light absorbed | Colour of coordination entity |
|---|---|---|---|
| $[CoCl(NH_3)_5]$ | 535 | Yellow | Violet |
| $[Co(NH_3)_5(H_2O)]^{3+}$ | 500 | Blue Green | Red |
| $[Co(NH_3)_6]^{3+}$ | 475 | Blue | Yellow Orange |
| $[Co(CN)_6]^{3-}$ | 310 | Ultraviolet | Pale Yellow |
| $[Cu(H_2O)_4]^{2+}$ | 600 | Red | Blue |
| $[Ti(H_2O)_6]^{3+}$ | 489 | Blue Green | Violet |

(a) Why does $[Co(CN)_6]^{3-}$ absorb U.V. light and not from visible region?
(b) Why is $[Ti(H_2O)_6]^{3+}$ violet in colour where as $[Cu(H_2O)_4]^{2+}$ is blue?
(c) (i) If CFSE for $[Co(NH_3)_6]^{3+}$ is 27000 $cm^{-1}$, what is CFSE for $[Cu(H_2O)_4]^{2+}$?
(ii) Why is $[Ti(H_2O)_6]^{4+}$ colourless?

**or**

(d) What will be the correct order for the wavelength of absorption for the following complexes? Give reason.
$[Co(CN)_6]^{3-}$, $[Co(NH_3)_6]^{3+}$, $[Cu(H_2O)_6]^{2+}$

# SECTION-E

**Directions (Q. Nos. 31-33) :** The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

**31.** Give explanation for each of the following:
(i) Why are aliphatic amines stronger bases than ammonia?
(ii) Why are aliphatic amines stronger base than aromatic amines?

**32.** What is electrochemical series? Write its applications.

**or**

(a) What is the difference between ferromagnetism and paramagnetism?
(b) For the cell shown below :
$Zn(s) \mid ZnSO_4(aq) \mid\mid CuSO_4(aq) \mid Cu(s)$
Calculate standard cell potential if standard state reduction electrode potential for $Cu^{2+} \mid Cu$ and $Zn^{2+} \mid Zn$ are $+0.34$ Volt and $-0.76$ Volt respectively.

**33.** What are the shortcomings of valence bond theory for bonding in complexes? Briefly describe the crystal field theory.

**or**

Briefly describe the importance of coordination compounds in:
(i) Qualitative analysis, (ii) Extraction of metals, (iii) Biological systems

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